

REMARKS

This Amendment is being filed in response to the Office Action mailed May 31, 2007. For the following reasons this application should be allowed and the case passed to issue. No new matter is introduced by this amendment. Support for the amendment to claim 1 is found in the specification, including Example 1. Support for the amendment to claim 12 is found in the paragraph bridging pages 16 and 17 of the specification and the paragraph bridging pages 20 and 21 of the specification. The specification at page 20, line 24 to page 22, line 21 support the amendment to claim 13. Support for the amendment to claim 15 and new claims 19 and 20 is found originally filed claims 15, 16, and 17, respectively. Claim 14 is amended to maintain proper dependency.

Claims 1, 11-15, and 18-20 are pending in this application. Claims 1 and 11-18 have been rejected. Claims 1 and 12-15 are amended in this response. Claims 2-10, 16, and 17 were previously canceled. Claims 19 and 20 are newly added.

Claim Rejections Under 35 U.S.C. § 112

Claims 15 and 18 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. The Examiner asserted that Applicants have not disclosed how to make or use the invention because there is allegedly no teaching of how to exclude the effect of the porosity of the adjacent electrode and porous insulating film when measuring the void size distribution of the interface of the electrode and porous insulating film by a mercury intrusion porosimeter. This rejection is traversed, and reconsideration and withdrawal thereof respectfully requested.

Claim 15 has been amended, therefore this rejection is moot. New claim 19 recites “a void size distribution of said negative electrode and said porous insulating film measured by a

mercury intrusion porosimeter has a peak in a region ranging from 1 to 4 μm .” It is clear from Fig. 5 that the distribution (B) of Ex. 6 has a peak in a region ranging from 1 to 4 μm but the distribution (C) of Com. Ex. 4 has no peak in the same region. Further, measuring a total distribution of the negative electrode and porous insulating film does not require excluding the effects of the porosities of the adjacent components. In view of the teaching of the specification and consideration of the *In re Wands* factors, it is clear to one of ordinary skill in this art that the present claims fully comport with the requirements of 35 U.S.C. § 112.

Claim Rejections Under 35 U.S.C. § 103

Claims 1 and 11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Inoue et al. (JP 9-147916) in view of Yukita et al. (US 5,705,292). This rejection is traversed, and reconsideration and withdrawal thereof respectfully requested. The following is a comparison between the invention, as claimed, and the cited prior art.

The Examiner asserted that Inoue et al. disclose a non-aqueous electrolyte secondary battery with a porous insulating layer comprising carboxy methyl cellulose and alumina coating the negative electrode and a separator with a ratio R of actual volume to apparent volume 0.5. The Examiner acknowledged that Inoue et al. do not teach the porosity of the porous insulating film. Relying on the Yukita et al. disclosure of a lithium ion secondary battery with a sprayed heat-resistant and heat insulating film comprising alumina and having a mean particle size of 20 μm and a porosity ranging from about 0 to 20%, the Examiner asserted it would have been obvious to combine the teachings of Yukita et al. with Inoue et al. to obtain the claimed battery.

The combination of Inoue et al. and Yukita et al. do not suggest the claimed non-aqueous electrolyte secondary battery. Inoue et al. and Yukita et al. do not suggest the porosity P of the

porous insulating film is not less than 0.35 and not greater than 0.65, as required by claim 1. As acknowledged by the Examiner, Yukita et al. teach a porosity ranging from about 0 to 20%.

The present claims are further distinguishable over the cited references because it would not have been obvious to one of ordinary skill in this art to combine Inoue et al. and Yukita et al., as advanced by the Examiner. The present claims require that the porous insulating film comprise an inorganic oxide filler and a film binder. The plasma spraying process of Yukita et al. takes place at 10,000 to 20,000 °C (col. 4, lines 37-42). At these temperatures the organic-based carboxy methyl cellulose binder of Inoue et al. would be destroyed. The Yukita et al. process can not be adapted for use with an organic-based binder. Further, the properties of the plasma-sprayed Yukita et al. porous insulating film would clearly be different from the properties of the Inoue et al. porous insulating film comprising a carboxy methyl cellulose film binder. One of ordinary skill would not have had any reasonable expectation that the porous film comprising an inorganic oxide and organic-based film binder Inoue et al. would have the same properties as a film consisting of an inorganic oxide applied by plasma spraying at 10,000 to 20,000 °C. Therefore, Inoue et al. and Yukita et al. do not suggest the claimed relation between the ratio of actual volume to apparent volume of the separator (R) and porosity of the insulating layer (P), as required by claim 1. Furthermore, the cited references do not suggest the unexpected improvement in battery characteristics disclosed in the present specification when the claimed relation between R and P is met. For example, Tables 2 and 3 of the present specification, teach that at $R-P < 0.30$ an unexpected improvement in discharge capacity results and at $R-P > -0.10$ high internal resistance and satisfactory shut-down effect is obtained.

Claims 12-14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Inoue et al. in view of Yukita et al. and further in view of Shinohara et al. (US 2002/0055036). This rejection is traversed, and reconsideration and withdrawal thereof respectfully requested.

The Examiner asserted that Inoue et al. disclose a non-aqueous electrolyte secondary battery with a porous insulating layer comprising carboxy methyl cellulose and alumina coating the negative electrode and a porous separator. The Examiner acknowledged that Inoue et al. do not teach the porosity of the porous insulating film. The Examiner asserted that Yukita et al. disclose a lithium ion secondary battery with a sprayed heat-resistant and heat insulating film comprising alumina and having a mean particle size of 20 μm and a porosity ranging from about 0 to 20%. The Examiner alleged that the inorganic particles of Yukita et al. are not perfectly smooth which reads on any particle that is comprised of primary particles. The Examiner acknowledged that Inoue et al. and Yukita et al. do not teach that the pore size distribution of the insulating film is not less than 0.15 μm . Relying on the Shinohara et al. teaching of a pore size of 3 μm or less, the Examiner asserted the claimed pore size would have been obvious to prevent short circuiting.

The combination of Inoue et al., Yukita et al., and Shinohara et al. do not suggest the claimed non-aqueous electrolyte secondary battery. Inoue et al., Yukita et al., and Shinohara et al. do not suggest the polycrystalline particles having the shape of dendrites, coral, or grape bunch, wherein the amount of the film binder contained in the porous insulating film is not greater than 4 parts by weight per 100 parts by weight of the inorganic oxide filler, and wherein 90% cumulative volume pore size D90 in a pore size distribution of the porous insulating film measured by a mercury intrusion porosimeter is not less than 0.15 μm , as required by claim 12.

Furthermore, as explained above, it would not have been obvious to combine Yukita et al. with Inoue et al. The addition of Shinohara et al. do not cure the deficiencies of Inoue et al. and Yukita et al. In addition, the 20 μm particle size taught by Yukita et al. is much greater than the particle sizes required by claims 13 and 14. The Examiner's apparent assertion that particles that are not perfectly smooth are necessarily polycrystalline particles is traversed. The Examiner provided no scientific or technical bases for this assertion.

Further, it would not have been obvious to combine Shinohara et al. with Yukita et al. as the plasma spraying temperature would destroy the shutdown separator of Shinohara et al., and Shinohara et al. teach much smaller particles than the 20 μm particles of Yukita et al. In addition, Examiner's conclusion that diffusion bonding the particles does not further limit the claims is incorrect. Contrary to the Examiner's assertion, diffusion bonding is a structural limitation. For example, one of ordinary skill in this art would be able to distinguish between particles that are diffusion bonded and those that are merely agglomerated by electrostatic attraction.

Claims 13 and 14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Inoue et al. in view of Yukita et al. and Shinohara et al. and further in view of Akashi et al. (JP 2004/010701). This rejection is traversed, and reconsideration and withdrawal thereof respectfully requested.

The Examiner acknowledged that Inoue et al., Yukita et al., and Shinohara et al. do not teach that the average particle size is not greater than 10 μm . Relying on the teaching of Akashi et al. that particles desirably have an average particle size of not greater than 3 μm , the Examiner considered the claimed particle size obvious.

As explained above, it would not have been obvious to combine Inoue et al., Yukita et al., and Shinohara et al. The addition of Akashi et al. do not cure the deficiencies of Inoue et al., Yukita et al., and Shinohara et al. Furthermore, because the plasma spraying process of Yukita et al. does not provide particles as small as the claimed particle size the asserted combination could not provide the claimed particles.

Claims 15 and 18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Inoue et al. in view of Ota et al. (US 6,365,300). This rejection is traversed, and reconsideration and withdrawal thereof respectfully requested.

The Examiner acknowledged that Inoue et al. do not teach the roughness of the electrode. The Examiner relied on the teaching of Ota et al. of an R_{max} value of not less than $0.01\text{ }\mu\text{m}$ and not more than $5\text{ }\mu\text{m}$ to aver that it would have been obvious to combine Ota et al. with Inoue et al. to provide good bonding of the electrolyte layer to the electrode. The Examiner considered the void size distribution to be an inherent property based on the electrode surface roughness.

The combination of Inoue et al. and Ota et al. does not render the claimed battery obvious. Inoue et al. and Ota et al. do not suggest the porous insulating film comprising an inorganic oxide filler and a film binder, wherein a void capable of retaining the non-aqueous electrolyte is formed on an adhering interface where the porous insulating film adheres to the electrode surface, and the amount of the film binder contained in said porous insulating film is not greater than 4 parts by weight per 100 parts by weight of said inorganic oxide filler, as required by claim 15.

Further, as regards the void size of new claim 19, the data in the specification clearly shows that the void size distribution is not an inherent property. As explained on pages 61 and

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62 of the specification, changing the drying temperature of the porous film changes the void size distribution. The cited references do not suggest the claimed void size distribution.

The dependent claims, including new claims 19 and 20, are allowable for at least the same reasons as the independent claims from which they depend and further distinguish the claimed non-aqueous electrolyte secondary battery.

In light of the above Amendment and Remarks, this application should be allowed and the case passed to issue. If there are any questions regarding these remarks or the application in general, a telephone call to the undersigned would be appreciated to expedite prosecution of the application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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